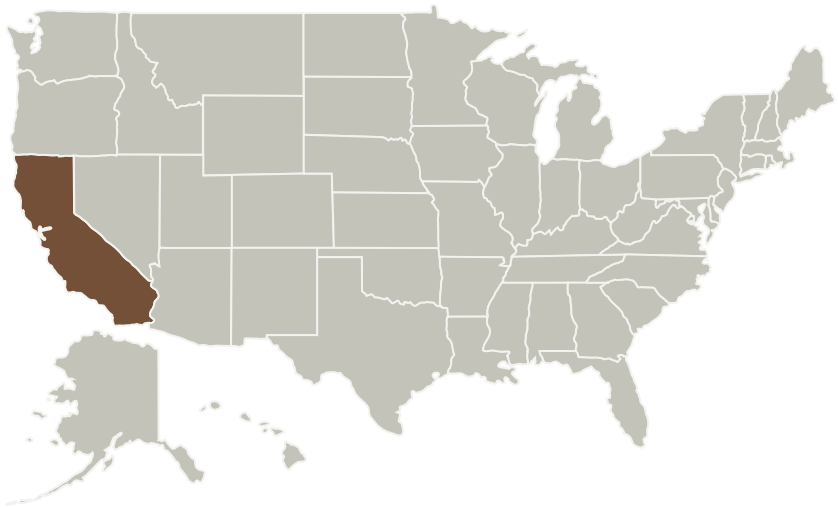
Broadband light rejection with the optical vortex coronagraph

Completed Technology Project (2014 - 2018)

Project Introduction

Our primary objective is to continue to improve the demonstrated performance of the optical vortex coronagraph, by extending our previous work from monochromatic to broadband light. Our specific goals here are thus demonstrations of broadband pseudo-starlight rejection at the 10-9 level (first for 10% bandwidth, and then 20%) using JPL's Compact Coronagraph (CC) testbed. We plan to carry out thorough mask testing by using our five existing test facilities that are fully available to us at JPL: a polarizing microscope, our polarization spectrometer, our Muller Matrix Imaging Polarimeter, the Infrared Coronagraphic Testbed (which also operates in the visible), and the new high-contrast Compact Coronagraph (CC). In particular, we have found Muller matrix imaging and cross-polarization spectroscopy to be extremely valuable initial measurement tools that can immediately characterize a vortex's wavelength response, thereby allowing us to better focus our efforts in the CC to only the most worthy vortices. Quick initial coronagraphic tests (without wavefront control) are also possible in the IRCT. Thus the vacuum CC would only be used for final deep testing of already vetted vortex masks. All of these initial steps should thus minimize the time needed in the high-contrast CC, thus maximizing efficiency and minimizing cost. Because of their high throughput and small inner working angle, vortex coronagraphs are of great interest to potential NASA's corona graphic missions such as Exo-C and HabEx, as well as to forthcoming large ground-based telescopes. A vortex coronagraph is also planned for the NASA-funded balloon project Picture-C, and that mission will specifically require broadband vortices.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Science Mission Directorate (SMD)

Responsible Program:

Strategic Astrophysics Technology

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Organizations Performing Work	Role	Type	Location
California Institute of Technology(CalTech)	Supporting Organization	Academia	Pasadena, California

Primary U.S. Work Locations
California

Project Management

Program Director:

Mario R Perez

Program Manager:

Mario R Perez

Principal Investigator:

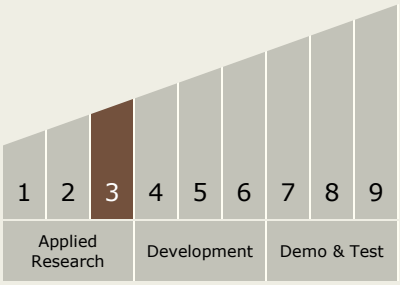
Gene Serabyn

Co-Investigators:

Dwight C Moody
John E Krist
Karen R Piggee
Dimitri P Mawet
John T Trauger

Technology Maturity (TRL)

Current: **3**



Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.3 Optical Components

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Target Destination

Outside the Solar System